REMARKS

Claims 1-2, 4, and 5 are pending. Claims 1, and 4 have been amended. Claim 3 has been previously cancelled. New claim 5 has been added. No new matter has been introduced. Reexamination and reconsideration of the application is respectfully requested.

In the December 8, 2003 Final Office Action, the Examiner rejected claims 1, 2, and 4 under 35 U.S.C. §103(a) as being obvious over Noro, U.S. Patent No. 4,969,195 (hereinafter the Noro reference), in view of Bonneville, U.S. Patent No. 5,729,611 (hereinafter the Bonneville reference). This rejection is respectfully traversed.

Amended Independent claim 1 recites:

An audio apparatus for use in a negative impedance drive of a loudspeaker having an internal impedance to perform a desired amplitude-frequency characteristic, comprising:

an amplifier device that drives the loudspeaker with a driving voltage;

a **providing section,** that provides a control voltage, **having as its sole input a level of the driving voltage of the loudspeaker**; and

a feedback device having a variable feedback gain that performs a positive feedback of a signal corresponding to the driving voltage of the loudspeaker to an input of the amplifier device thereby causing the amplifier device to generate a negative impedance effective to negate the internal impedance of the loudspeaker, **the feedback device comprising a voltage-controlled amplifier** having the variable feedback gain and receiving the signal corresponding to the driving voltage, the **voltage-controlled amplifier being responsive to the control voltage from the**

providing section and the signal corresponding to the driving voltage for generating an output signal and positively feeding back the output signal to the input of the amplifier device to thereby perform the positive feedback, wherein the voltage-controlled amplifier decreases the variable feedback gain as a level of the control voltage increases, thereby adjusting the amplitude-frequency characteristic of the amplifier device, only if the level of the control voltage exceeds a critical level, and otherwise keeps the variable feedback gain constant as long as the level of the control voltage remains under the critical level.

The Examiner rejected claims 1, 2, and 4 under 35 U.S.C. §103(a) as being obvious over the Noro reference, in view of the Bonneville reference. In so doing, the Examiner stated "Noro does not specify: that the device responding to the feedback gain control is a voltage controlled amplifier". The Examiner also stated "Bonneville discloses an overload protection circuit for a negatively driven loudspeaker. The device comprises both a main feedback loop and a feedback loop for adjusting a voltage controlled amplifiers (22, 24) (col. 3, lines 29-44 and 57-62)."

Neither the Noro reference nor the Bonneville reference discloses, teaches, or suggests the audio apparatus specified in independent claim 1, as amended. Unlike the audio apparatus specified in independent claim 1, as amended, the Noro reference or the Bonneville reference does not show "a **providing section**, that provides a control voltage, **having as its sole input a level of the driving voltage of the loudspeaker**" and "**a feedback device having a variable feedback gain** that performs a positive feedback of a signal corresponding to the driving voltage of the loudspeaker to an input of the amplifier device thereby causing the amplifier device to generate a negative

impedance effective to negate the internal impedance of the loudspeaker, **the feedback device comprising a voltage-controlled amplifier** having the variable feedback gain and receiving the signal corresponding to the driving voltage, the **voltage-controlled amplifier being responsive to the control voltage from the providing section** and the signal corresponding to the driving voltage for generating an output signal and positively feeding back the output signal to the input of the amplifier device to thereby perform the positive feedback".

The Noro reference teaches an impedance compensation circuit of a speaker driving system wherein an ideal impedance state of the speaker can be equivalently formed by the **equivalent impedance means**, and is compared with **an impedance state of an actual speaker**. On the basis of the comparison result, a positive feedback gain in the speaker driving means is controlled. The Noro reference states "an **equivalent impedance means 4** equivalently forms an ideal impedance state of the speaker 3 when viewed from the speaker driving means 1, and has an equivalent impedance Z_{ref}. The output from the means 4 is supplied to a comparison means 5. The **comparison means 5 compares the output signal from the equivalent impedance means 4 with a voltage detected by the detection element Z_S**, and **supplies a comparison result to a feedback gain control circuit 6**. The feedback gain control circuit 6 controls a feed back gain of the feed back path to the amplifier 11 **on the basis of the comparison result by the comparison means 5**." (Col. 3, lines 40-51.)

The Noro reference does not disclose, teach, or suggest the audio apparatus specified in independent claim 1, as amended. Unlike the audio apparatus specified in

independent claim 1, as amended, the Noro reference does not show "a **providing section**, that provides a control voltage, **having as its sole input a level of the driving voltage of the loudspeaker**". The Noro reference teaches the feedback gain control circuit 6 controls a feed back gain of the feed back path to the amplifier 11 on the basis of the **comparison result** by the comparison means 5 wherein the comparison means 5 compares the output signal from the **equivalent impedance means 4** with a voltage detected by the detection element Z_S, and **supplies a comparison result** to a feedback gain control circuit 6.

The Bonneville reference teaches the use of "**negative feedback**" derived by monitoring actual displacement of a loudspeaker's electroacoustic transducer or cone to compensate for transducer non-linearities. For example, the Bonneville reference states "the output of the summing device 32, i.e. **the feedback signal**, comprises three components proportional to acceleration, velocity and position, respectively. This **feedback signal** is applied to a second summing device 42 connected between voltage controlled amplifiers 22 and 24, respectively. The second summing device 42 subtracts the feedback signal from the audio signal applied to the input of second voltage controlled amplifier 24 and supplies the resulting difference signal to the compensation filter 26 and thence to power amplifier 16. " (Col. 3, lines 41-55).

The Bonneville reference teaches the use of **negative feedback** in which the **feedback signal** is applied to **a second summing device 42** connected between voltage controlled amplifiers 22 and 24, respectively. The second summing device 42 **subtracts the feedback signal from the audio signal** applied to the input of second voltage controlled amplifier 24 and supplies the resulting difference signal to the

compensation filter 26 and **thence to power amplifier 16**. The power amplifier then drives the speaker 10.

The Bonneville reference does not teach **positive feedback** of a signal corresponding to the **driving voltage of the loudspeaker to an input of the amplifier device**. The amplifier device of the present invention drives the loudspeaker and is not the voltage controlled amplifier in the feedback branch.

The Bonneville reference does not show "a feedback device having a variable feedback gain that performs **a positive feedback of a signal corresponding to the driving voltage of the loudspeaker to an input of the amplifier device** thereby causing the amplifier device to generate a negative impedance effective to negate the internal impedance of the loudspeaker, the feedback device comprising a voltage-controlled amplifier having the variable feedback gain and receiving the signal corresponding to the driving voltage, the **voltage-controlled amplifier being responsive to the control voltage from the providing section** and the signal corresponding to the driving voltage for generating an output signal and positively feeding back the output signal to the input of the amplifier device to thereby perform the positive feedback".

Accordingly, the Applicant respectfully submits that independent claim 1, as amended, distinguishes over the above-cited references. Claim 2 depends directly from independent claim 1, as amended. Therefore, Applicant respectfully submits that claim 2 distinguishes over the above-cited references for the same reasons as set forth above with respect to independent claim 1, as amended.

Amended Independent claim 4 recites:

An audio apparatus for use in a negative impedance drive of a loudspeaker having an internal impedance to perform a desired amplitude-frequency characteristic, comprising:

an amplifier device that drives the loudspeaker with a driving voltage;

a providing section that provides a control voltage corresponding to a level of the driving voltage of the loudspeaker; and

a feedback device having a variable feedback gain that performs a positive feedback of a signal corresponding to the driving voltage of the loudspeaker to an input of the amplifier device thereby causing the amplifier device **to generate a negative impedance effective to negate the internal impedance of the loudspeaker**, the feedback device comprising a voltage-controlled amplifier having the variable feedback gain and receiving the signal corresponding to the driving voltage, the voltage-controlled amplifier being responsive to the control voltage from the providing section and the signal corresponding to the driving voltage for generating an output signal and positively feeding back the output signal to the input of the amplifier device to thereby perform the positive feedback, wherein

the voltage-controlled amplifier decreases the variable feedback gain as a level of the control voltage increases, thereby adjusting the amplitude-frequency characteristic of the amplifier device so as to suppress the amplitude-frequency characteristic of the amplifier device, **thereby preventing an output of the amplifier device from clipping**, only if the level of the control voltage exceeds a critical level, and otherwise keeps the variable feedback gain constant as long as the level of the control voltage remains under the critical level.

Neither the Noro reference nor the Bonneville reference discloses, teaches, or suggests the audio apparatus specified in independent claim 4, as amended. Unlike the audio apparatus specified in independent claim 4, as amended, the Noro reference or the Bonneville reference does not show "a feedback device having a variable feedback gain that performs a positive feedback of a signal corresponding to the driving voltage of the loudspeaker to an input of the amplifier device thereby causing the amplifier device **to generate a negative impedance effective to negate the internal impedance of the loudspeaker**" and "the voltage-controlled amplifier decreases the variable feedback gain as a level of the control voltage increases, thereby adjusting the amplitude-frequency characteristic of the amplifier device so as to suppress the amplitude-frequency characteristic of the amplifier device, **thereby preventing an output of the amplifier device from clipping**".

It is respectfully submitted that it would not have been obvious to one skilled in the art to combine the teachings of the Noro reference and the Bonneville reference, as suggested by the Examiner. It is well settled that a reference must provide some motivation or reason for one skilled in the art (working without the benefit of applicant's specification) to make the necessary changes in the disclosed device. The mere fact that a reference may be modified in the direction of the claimed invention does not make the modification obvious unless the reference expressly or implicitly teaches or suggests the desirability of the modification. In re Kotzab, 55 U.S.P.Q.2d 1313, 1317-18 (Fed. Cir. 2000); In re Fitch, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992); In re Mills, 16 U.S.P.Q.2d 1430, 1432 (Fed. Cir. 1990).

The cited references, i.e., the Noro and the Bonneville references, fail to meet the basic requirement for a finding of obviousness established by the courts in Kotzab, Fitch, and Mills. There is no suggestion in either reference of modifying an impedance compensation circuit using an equivalent impedance means compared with an impedance state of an actual speaker as in the Noro reference in the direction of the present claim, i.e., "the voltage-controlled amplifier decreases the variable feedback gain as a level of the control voltage increases, thereby adjusting the amplitude-frequency characteristic of the amplifier device so as to suppress the amplitude-frequency characteristic of the amplifier device, **thereby preventing an output of the amplifier device from clipping**".

Based on the Applicants' specification and claims, the Examiner is combining different references which are unrelated to each other, and none of which contains any teaching to be combined with each other. Noro teaches an impedance compensation circuit in a negative impedance drive of a loudspeaker but **makes no mention whatsoever of an overload protection capability**. Noro also uses a comparison means to provide a signal to a multiplier. The multiplier does not provide overload protection and cannot be simply replaced with a voltage controlled amplifier as suggested by the Examiner. The present invention utilizes a voltage controlled amplifier to achieve a negative impedance drive of a loudspeaker and to provide an overload protection capability. Bonneville discloses an overload protection circuit but not for a negatively driven loudspeaker as suggested by the Examiner. The Examiner suggests it would have been obvious to replace the multiplier of the Noro impedance compensation circuit utilizing a comparison means with the voltage controlled amplifier

of the Bonneville overload protection circuit. Such is not the case. Neither Noro nor Bonneville teach both negative impedance drive and overload protection using a voltage controlled amplifier in a feedback loop.

Accordingly, the Applicant respectfully submits that independent claim 4, as amended, distinguishes over the above-cited references.

New claim 5 depends directly from independent claim 4, as amended. Therefore, Applicant respectfully submits that claim 5 distinguishes over the above-cited references for the same reasons as set forth above with respect to independent claim 4, as amended.

Applicant believes that the foregoing amendment and remarks place the application in condition for allowance, and a favorable action is respectfully requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles telephone number (213) 488-7100 to discuss the steps necessary for placing the application in condition for allowance should the examiner believe that such a telephone conference would advance prosecution of the application.

Respectfully submitted,

PILLSBURY WINTHROP LLP

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By: _____
Roger R. Wise
Registration No. 31,204

725 South Figueroa Street, Suite 2800
Los Angeles, CA 90017-5406
Telephone: (213) 488-7100
Facsimile: (213) 629-1033